REMARKS

As explained from paragraph 10 onwards of the Office action, claims 1-59 have been rejected as obvious over Iijima et al. when combined with the teaching of Riga et al. and other references.

The product claimed in the present Application is a particle which contains choline chloride in the form of a dry, crystalline powder with a protective coating that consists of a continuous inner layer of hydrophobic substances and a continuous outer layer of carnauba wax. Iijima et al teaches a granular composition containing choline where both the hydrophobic substance and the carnauba wax are used as binders or as a single layer. Iijima et al does not teach the overcoating of choline chloride comprising an outer layer of carnauba wax and an inner layer of a hydrophobic substance, and so does not teach the advantageous and unexpected effects thereof.

The Examiner cites the teaching of Iijima et al. combined with that of Riga et al. and argues that the combination of the teachings renders the present invention according to claim 1 obvious. Riga et al. is cited by the Examiner because it teaches a composition of enterosoluble units where a first layer of retardation is achieved by a polymer coating of ethyl-cellulose (ref. col.9 , lines 18-19) and carnauba wax is used as an outer second layer of retardant (ref. col. 9, lines 19-20).

The Applicant argues that the combination of the teachings of the documents Iijima et al., Riga et al., and optionally others, do not render the claimed invention of claims 1-59 obvious. There are 2 reasons why said combination is not obvious to the person skilled in the art.

The **first reason** is that the person skilled in the art is not motivated to combine the teachings of Iijima et al with Riga et al to achieve a better retardant for a ruminant digestive system. Riga et al. teaches the use of retardant particle for a monogastric animal. This is clear from the context of the entire invention taught in Riga et al., as for example at column 21, lines 40-41.

The person skilled in the art is discerning when transferring teachings of the positive effects of retardants from monogastric animals to application in ruminant animals as they are

polygastric animals. It is well-accepted in the art that ruminant animals have a more complicated digestive system that poses harsher conditions on the digestion of material through its system when compared to that of mono-gastric animals.

As an example of the large difference in the technical field of retarding digestion in that of monogastric and that of ruminant polygastric animals, the Applicant points to the fact that Riga et al. teaches ethyl-cellulose as a retardant in monogastric animals. Ethyl-cellulose is partly ethylated cellulose and partly soluble in water. Cellulose is wholly not soluble in water. In ruminant animals, cellulose is digested by the different and more complicated digestive system of ruminants(the Applicant refers the Examiner to page 4, lines 1-5 of the Application), thus one can easily see how ethyl-cellulose would be also. Thus, where in Riga et al. ethyl-cellulose is a retardant, in the ruminant it is easy to see how it cannot be such.

As another example of the large difference in the technical field between digestion in monogastric and ruminant polygastric animals, the Applicant cites that Riga et al. teaches at column 11, line 4 that the resistance of the active principle inside the retardant particle is <u>about 2 hours</u>. Enterosolubilisation is about 1 hour so the upper limit of the gastric resistance conferred by the particle in Riga et al. can't be much higher than the 2 hours. It is well-known to the person skilled in the art that the time which a digested particle is placed under in the digestive system of ruminants is much longer.

The Applicant encloses as proof of said affirmation a copy of page 23 of B. A. Dehority, *Gross anatomy, physiology and environment of the ruminant stomach*, in *Rumen Microbiology*, Nottingham, NUP, 2003, where one can see that it is taught that the "Rumen solids turnover times in cattle have been observed to range from 1.3 to 3.7 days, with most values averaging about 2.1 to 2.7 days or <u>50-60 hours</u>." (ref. page 23, third paragraph).

It is thus clear that the conditions of the ruminant digestive system is much **<u>more stringent and complicated</u>** than that of the monogastric animal.

The person skilled in the art needs to be thus strongly motivated to combine the separate documents to achieve a better retardant for ruminant animals. The Applicant argues that there is nothing in Riga et al. that suggests or motivates the person skilled in the art to transfer the teaching of using carnauba wax as an outside layer of retardant in a particle for use in monogastric animals to polygastric animals, particularly when the other retardant layer suggested does not work in ruminant animals.

The **second reason** that the invention according to the present application is not obvious over the combination of the teachings of Iijima et al with Riga et al. is that the particles according to the invention have **to be stable**, as well as being rumen stable and post ruminally effective. Said stability is required for 2 reasons(ref. page 11, lines 1-4):

i) stability under conditions necessary for its process of manufacture and

ii) stability when mixed into feed or premix.

As demonstrated by the comparative tests, as described at pages 26-31 and the results thereof in Tables 1-5, the particle according to claim 1 is demonstrated to be stable both over time and in presence of feed or premixes. This is especially clear when compared to commercially available products and the controls 1-3. This second advantageous and unexpected effect is not taught, nor suggested in either Riga et al. or Iijima et al.

Thus the Applicant argues, that the invention according to claim 1 is for two separate and independent reasons not obvious before the combination of prior art Riga et al. combined with Iijima et al.

The Applicant further argues that, since claim 1 is both novel and not obvious before the prior art, the claims 2-8, 22-40, and 46-56 thereof are also novel and non-obvious.

The Applicant further agues that claims 9-14 and 57-59 are also novel and non-obvious in front of the combination of Riga et al., Iijima et al and Richardson et al. for the aforementioned two reasons given above.

The Applicant further agues that claims 15-19 and 41-42 are also novel and non-obvious in front of the combination of Riga et al., Iijima et al and Brommesielk et al. for the aforementioned two reasons given above.

The Applicant further agues that claims 20-21 and 43-45 are also novel and non-obvious in front of the combination of Riga et al., Iijima et al, Richradson et al. and Brommesielk et al. for the aforementioned two reasons given above.

For all these reasons, it is apparent that the claims as now presented clearly define over the prior art. Accordingly, a Notice of Allowance is now in order and is respectfully requested.

If any additional fees are required by this communication, please charge such fees to our Deposit Account No. 16-0820, Order No. BUG5-36500.

Respectfully submitted,
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Rumen Microbiology

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swallow if not for the moistening effect of saliva. Fairly high concentrations of both sodium and potassium bicarbonate and phosphate are found in saliva, which help buffer the acids produced during fermentation in the rumen. In addition, nitrogen, primarily as urea, mucin, phosphorus, magnesium and chlorine are also present in fairly high concentration, and undoubtedly serve as a readily available supply of nutrients to the microorganisms. Recycling of nitrogen in the saliva can be very important in instances of low dietary nitrogen intake. The quantity of saliva produced per day, depends on the type and quantity of feed, ranging from about 5-15 liters for sheep and 75-190 liters for cattle (Hungate, 1966; Church, 1969, 1976, 1988).

The amount of time an animal spends ruminating is thought to be controlled by the particle size of the ingesta. For example, feeding only grain or finely ground roughage results in cessation of rumination. If an animal is fed hay through a fistula rather than by mouth, rumination time is increased. An excellent series of studies on rumination in sheep have been published by Welch and Smith (1968, 1969a, b, 1970) and Welch *et al.*, (1970). Briefly they found that marked diurnal patterns occurred in rumination time, the peak activity taking place during the night. Fasting caused a rapid decline in normal rumination activity, which ceased entirely after 36 hours. Rumination was initiated soon after the first meal following a fast. During an average 24 hour period, their animals spent approximately 6 hours eating (chopped forage fed twice a day at 15% excess), 9 hours ruminating and 9 hours idle. Poor quality roughage with high fiber content caused an increase in rumination time. Rumination time increased with increased size of single meals and was higher than for an equal weight of hay fed continuously. In subsequent studies with cattle, decreasing forage quality increased rumination time, and a difference in rumination time was observed between four breeds of dairy cattle fed an identical ration.

PASSAGE OF INGESTA FROM THE RUMEN-RETICULUM

Level of intake, particle size, specific gravity, and concentration of solids all appear to be factors which can influence the rate of ingesta movement through the reticulo-rumen (Hungate, 1966; Church, 1969, 1976; Owens and Goetsch, 1988). Rumen solids turnover times in cattle have been observed to range from 1.3 to 3.7 days, with most values averaging about 2.1 to 2.7 days or 50-60 hours. Turnover times are somewhat less in sheep, ranging from 0.8 to 2.2 days with the majority of values being slightly over one day.

Rumen volumes and fluid turnover rates were measured in the same sheep fed either 100% hay or 60% corn-40% hay at equal dry matter intakes (Grubb and Dehority, 1975). Rumen volume decreased in two of the three sheep when the concentrate ration was fed; however, no significant differences were observed in fluid turnover rate (Tables 2.1 and 2.2). In contrast, dry matter turnover time was significantly longer when the concentrate diet was fed (Table 2.3). However, dry matter digestion was also significantly